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FORESDA

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O 5.1 New Value Chain Cases for Durable Innovation

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LIST OF ABBREVIATIONS

CN = Collaboration Network

DTP = Danube Transnational Programme

FBI = Forest-based Industries

FORDIS = The Acronym of the Collaborative Network “Socially Responsible Use of Forests”

FORESDA = Project "Forest-based cross-sectoral value chains fostering innovation and competitiveness in the Danube region"

IP = Innovation Project

LAP = Local Action Plan (Project Deliverable 6.2.4 Local Action Plan)

LIAP = Local Innovation Action Plan (Project Output 3.2 Local Innovation Action Plans)

MH = Methodology Handbook

PA = Priority area

PP = Project partner

RIS = Regional innovation system

TS = Transnational Strategy (Project output 3.1 Transnational Strategy on Cross-sectoral Level)

TTO/KTO = Technology transfer office/Knowledge transfer office

1. EXECUTIVE SUMMARY

This document provides an output (Project output 5.1) of FORESDA project (Interreg Danube Transnational Programme). FORESDA's main objective is to support the transformation of traditional forest-based industries into sustainable manufacturing areas by an innovative cross-sectoral and transnational approach, which included development and support to the building of cross-sectoral and transnational Collaborative Networks (CNs) and Innovation Projects (IPs) as idea generation engines which gathered international, cross-sectoral networks/consortia of SMEs, large companies and research organizations. FORESDA consortium offered a training and innovation support (Project output 5.2) to those networks aiming to strengthen the innovation capacity of the involved stakeholders, particulary SMEs, and the main result are building of the new value chains which supported the development of the new cross-sectoral and innovative products and services (Project output 5.3). The document provides the information about the objectives and approach of the consortium on the way towards establishing the new value chains within the CNs and IPs, and gives an overview of the results achieved by the implemented activities in the framework of the contribution to the regional S3 strategies and European bioeconomy strategy.

2. BACKGROUND OF NEW VALUE CHAIN CASES FOR DURABLE INNOVATION

2.1 OBJECTIVES

The aim of the development of the CNs within FORESDA project is to support the development of new products, processes and services which can be generated through collaboration of all or some partners of the CNs' members. This collaboration should be based on cross-sectoral and transnational activities in the framework of three selected strategic innovation areas:

1. Building with wood
2. Creative hub
3. Socially responsible use of forest resources.

The main goal is to involve and support SMEs' innovation efforts in the establishement of the new value chains. The term "value chain" was coined by Harvard Business School professor Michael Porter in 1985 to describe the set of activities performed to design, produce, market, deliver, and support products. However, the competitiveness of today's economy, forces the companies to increase a quality of the products/services by lowering the production costs and increasing the customer service. In a world where information flows freely, product lifespans are collapsing, and consumers value products that better meet their needs, even if, or in some cases especially if, they have to interact directly with providers, this is beginning to change. Enabling technologies and changing customer behaviors allow new entrants to remove low-value stages or shift stages to different types of participants and seize economic benefits for themselves and their customers.

In that process, the value chain analysis is one of the most valuable tools which helps companies to identify parts of the business process, including production, which can achieve cost savings or enhanced production/service. At the end of that process, customers benefit by having access to the high-quality products/service at lower costs. The process often requires introduction of some innovations which shift of fully eliminate some of the phases in the design, production, commercialization, distribution and even support of products in the process of offering a new values.

Being increasingly affected by climate changes, as well as all kind of advances in new technologies such as the increasing role of services, and societal and political interests towards low carbon bioeconomies, the global forest sector is also becoming more complex and interlinked.

Already, the concept of the 'forest-based sector or industries is beginning to replace the conventional concept of the 'forest sector'. Moreover, with this development, the challenges between different industries and service sectors related to the use of wood and forests, and potential trade-offs between environmental values and material use are becoming more intensive.

2.2 APPROACH

There are many challenges that forest-based industries are today faced with, however the following challenges are the most important and finding solution will make the biggest impact within the forest-based industries but also other industry sectors:

- Climate change
- Competition for wood resources
- Fast changing consumer demands
- Growing complexity of manufacturing processes
- Lack of qualified workforce.

In addition, forest-based industries are considered to be conservative sectors. Therefore FORESDA's aim is to reveal their potential of being sustainable manufacturing areas by linking them to other sectors and consequently building the new value chains to meet all that challenges. The process is based on transnational and cross-sectoral approach to the implemented project activities:

1. *Development of collaborative networks and innovation projects as idea generation engines;*
2. *Implementing cross-sectoral pilot innovation environments*
3. *Building up supportive capacities in clusters, intermediaries, research organizations and policy makers.*

All project activities are strongly linked in order to provide the long-term quality support to the development of new value chains as one of the most valuable project output:

1. *Development of collaborative networks and innovation projects;*

   The CNs are defined as international, cross-sectoral networks of SMEs, large companies and research organisations. The main goal of the CNs is to generate ideas through promotion, co-creation and matchmaking activities, but also to validate and evaluate them addressing both technical and market aspects. In addition, each of the CN developed a joint innovation agenda to be able to function also beyond the project lifetime.

2. *Implementing cross-sectoral pilot innovation environments*

   The development and support to the innovation activities is organised not only through the promotion, co-creation and matchmaking activities, but IPs also get the non-financial support measures in the form of the methodological support and technical/scientific support. However, they can also make use of the pilot innovation environments, the ten regionally implemented pilot projects which foster cross-sectoral innovation activities in FBI SMEs with different focus.

3. *Building up supportive capacities in clusters, intermediaries, research organizations and policy makers*

   In order to ensure the long-term support from the supporting organizations which are considered to be one of the major tools for increasing innovations and competitiveness in the FB sectors, FORESDA also implemented activities towards improving the internal skills and strengthening the intermediary role between the productive sector and the knowledge poles (clusters, technology poles, regional development forces, R&D organizations) on regional, national but also transnational and cross-sectoral level. Accordingly, those target groups are also involved in the development of the new value chains either as member of the CNs or members of the IPs consortia.

As one of the main project results, FORESDA consortium actively supports development of new value chains within the three transnational and cross-sectoral collaborative networks addressing three specific strategic innovation areas (Building with wood, Creative hubs, Socially responsible use of forests). Each of the CNs involves at least ten SMEs and one R&D. They act as idea generation engines for new products, processes, services on the mid-term (at least five years beyond the project lifetime), and contribute to foster cross-sectoral, transnational innovation in the project countries and beyond.

3. NEW VALUE CHAIN CASES WITHIN COLLABORATIVE NETWORKS

The following subchapters provide an overview of the new value chain cases built within the collaborative networks, and explain the challenges and structure related to the establishment of new value chains within each of the CN. In addition, they also elaborate conclusions and give recommendations on how to continue with the support and development of new value chains within forest-based sectors.

3.1 CN "BUILDING WITH WOOD"

3.1.1 INTRODUCTION

The lack of affordable housing is an urgent issue in many European regions, especially in cities and their expansion areas. Driven by the global trend of urbanization, growing conurbations face the difficult challenge of providing the building materials for housing of general interest while preserving the valuable natural resources and societal and cultural heritage. Further challenges to be observed include the looming further scarcity of fossil fuels, but also of other natural resources, demographic change and changes in housing demand.

The results of the FORESDA project showed that building with wood is an important topic in the Danube area and in the whole European countries. Buildings are responsible for approximately 40 % of energy consumption and 36 % of CO2 emissions in the EU (see EPBD, DIRECTIVE 2010/31/EU). Building with wood could be one option for dealing with the up-coming challenges (e.g. scarcity of fossil fuels, changes in housing). Wood and other biogenic materials are regional available and lightweight materials as well as easy to re-used materials and have lesser impact for societal, natural and cultural heritage (connect people with nature through the build environment). However, there is a lack of this knowledge of the good wood properties and the possible processes and applications of timber constructions (e.g. constructional expansion) in many regions in the Danube area. Based on this results the FORESDA partners established a collaborative network in this area and supported by different activities.

3.1.2 STRUCTURE

The collaborative network (CN) is leading by the Department of Forest Products Technology and Timber Constructions at Salzburg University of Applied Sciences. Partners of the “Building with

Wood" network are at least twenty-nine SMEs, technology parks owners and cluster organisations from Austria, Bosnia Herzegovina, Hungary, Slovenia and Austria. Furthermore, twelve partners of the FORESDA project (Research and Academia, Cluster organisations, regional economic development agencies and Business support units) support the CN and signed the CN agreement. Through the transnational bilateral cooperation of partners, a good framework conditions for innovation is set. Innovations and best practice examples increase the positive image of timber constructions and promote the use of bio-based materials for building.

The members of the Collaboration Network agree jointly to contribute to the development of a Joint Innovation Agenda encompassing potential new products, processes and services in relation to the topic Building with wood. The Collaboration Network will be continuously expanded during the course of the project.

The long-term aim of the Collaboration Network is to contribute to the development and roll-out of such new products, processes and services in relation to the topic Building with wood. The Collaboration Network Agreement has no formal end. Participation to the activities beyond the end of the FOREDA project will take place on a voluntary basis.

3.1.3 New Value Chains

Based on the market opportunities and potential for innovation the focus of the CN laid on bio-based materials. The various product ideas and related market opportunities will be further elaborated through the work in the network so that only one idea can finally implement to the market. Bio-based resources are not used at the current situation and are residues. Materials out of bark have good insulation properties and have a high potential on the market and are regional available for the further usability.

Some partners are very active in this field. However, the development of new products and production processes are time-consuming. This is an ongoing process and did not finished by the end of the FORESDA project. For the work within this established CN some research funding is necessary for updating all partners about the news and working actively together. If the member of the collaborative networks will get the research funding, then the established process for developing new value chains (e.g. materials and processes) will be carried on within this CN.

Through the CN activities a huge number of important inputs for the building with wood were developed in the network. These findings were clustered and were implemented in the research proposal DOUBLED, which was successfully submitted an expression of Interest (EoI) on the first step of Third call for proposals of the Danube Transnational Programme.

3.1.4 Conclusions and Recommendations

The AF of the FORESDA project defines the requirements of the CN, which was a very optimistic approach for a transnational and cross-sectoral network and are not very feasible. Nevertheless, the CN is too big and has too different interests. It is impossible to reach all network partner within on telephone conference and bring all partners at the same knowledge stand. Furthermore, without any trust of the CN partners the developing processes for new products or processes cannot be started, which was very critical in the first stage of the development progress - establishing of the CN. This was the first barrier to attract SMEs in different countries.

The CN was built to support the development of the Building with Wood in the Danube region. The main objectives are to develop a broad spectrum of product ideas and to select one of them for R&D and market implementation. The Building with Wood network builds on a strong kernel of well-established SMEs, dynamic clusters, intermediaries, research and education specialists, policy makers and their networks representing a significant part of the strong traditional SME-dominated wood and timber constructions sectors in the Danube region to promote the image of timber constructions (mainly in south-eastern countries) for the further development of innovative value chains.

A huge number of important inputs for the building with wood were developed in the network. These findings were clustered and were implemented in the research proposal DOUBLED, which was successfully submitted an expression of Interest (EoI) on the first step of Third call for proposals of the Danube Transnational Programme.

3.2 CN "CREATIVE HUBS"

3.2.1 INTRODUCTION

New business models are emerging as a consequence of technological and transitional changes in global economy. They are not primarily based on material resources and traditional industries that become more unsustainable. Their focus is on the use of human resources, knowledge, specific skills and intangible products. The region is experiencing spill-over effects of global and regional trends of development and implementation of new business models, which are changing existing markets, processes and behaviours of actors, heavily using rapid development of new technologies. Significant impact of changes is expected to be directed towards traditional industries. New business models recognize potentials of culture, creativity, intellectual property, knowledge, personal property, connecting technologies, social networking, financial innovations, artificial intelligence, crypto currencies, etc. for further development processes and competitiveness of business environment of the programme area. Their growing significance in terms of direct and indirect correlations to the business sector and society in general, need to be revealed and become more visible through the development and promotion of new business models in context of the transnational economy.

Market of forest-based industries is under the influence of specific trends, including:

- Application of IT tools and new technology devices. IT tools are in use in marketing, especially in sales, with “on-line” design and order options, which are changing the flows in seller – consumer relations (Virtual Reality and Augmented Reality). Application of IT tools becomes an imperative in terms of maintenance and enhancement of the position on the market. Additionally, 3D modelling becomes more accessible and affordable with Rapid prototyping technology (3D printing/scanning), CNC processing, etc.
- Increase of significance of creative industries. Creative industries are present in 99% of actual goods available on the market today, becoming increasingly important in terms of competitiveness on the market.
- Digitalization of production processes. Digitalization processes have presented significant “game-changer” potential. Particularly affected are production processes, in which the digital solutions and strategies have increasing significance. With digital solutions developed to optimize production processes, companies from the sector have become

more agile on the market, and in position to raise competitiveness not exclusively on the bases of lower costs of production inputs.

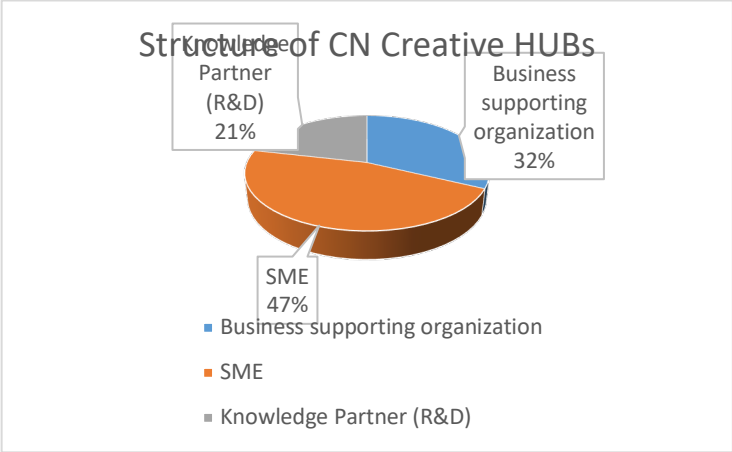
- Cross sectoral aspect of Forest-based industries. Product design is largely based on the principle of combination of resources and cross sectoral cooperation. Cooperation implies relations between different types of traditional processing industries, as well as relations involving IT sector resulting in new features and characteristics of products – innovations.
- Co-working/Free lancing. Business development processes are getting increasingly initiated as a result of economic and social interactions, which are taking place in dedicated co-working spaces ("hubs"). Usually, processes in subject, are the result of combination of relevant individual expertise and know-how in product design and innovation. Particular sectors in focus are IT and digital economy.

3.2.2 STRUCTURE

Collaborative Network on the subject of Creative HUBs is established within FORESDA.
Core membership in Collaborative Network on Creative HUBs is made out of dedicated FORESDA project partners, engaged on targeted development issues on a long term bases. Within the framework of FORESDA, basic understanding of targeted subject is reached, with pin pointed project partners and network members with relevant capacities and interest to pursue identified challenges in the next period of 5 years.

FORESDA project partners are the backbone of the network, involving Agency PREDA, CyberForum e.V., inno AG, Wood Industry Cluster, Slovenian Forestry Institute, Salzburg University of Applied Sciences, Croatian Wood Cluster, KO-FA Association – legal entity of the PRO WOOD Regional Wood Cluster, University of Belgrade – Faculty of Forestry and Zenica Development Agency "ZEDA". Within the network, FORESDA partners are supported by the group of institutions – combination of SMEs, Knowledge Partners, R&D and Business supporting organization. Network is not fixed with increasing number of members over the course and beyond the implementation of FORESDA. Transnational cooperation experienced throughout FORESDA has brought the issue of cross sectoral cooperation between forest based industries and creative industries in the centre of the attention. The subject has raised interest and animated actors to get actively involved in exploring and exploitating potentials for development.

Currently, CN Creative HUBs involve 28 subjects, as illustrated on the following chart:



3.2.3 New Value Chains

The members of the Collaborative Network Creative Hubs agreed the fact that the aspect of cooperation between forest based industries (FBI) and Creative industries is emerging and has a potential to largely influence development of new products, processes and services. Concept of the network is defined according to specific features identified within FORESDA, primarily cross sectoral cooperation potential in relation between forest based industries, IT, new technologies and creative industries.

Joint Innovation Agenda is prepared on the level of established CN Creative Hubs, as framework for cooperation in the near future. Joint Innovation Agenda has defined the objectives and main focus. Consequently, the network will be concentrated on the transferability potential of cooperation between Creative/IT sector and Forest-based industries, which is estimated as considerable. Creative industries will be used as a tool to stimulate economic development, to achieve greater visibility in a wider environment, in synergy with traditional industries, especially with FBI. Development model will be based on supporting physical infrastructure and access to know-how services, new technologies, methodologies for stimulation of innovation processes and facilitation of transnational connections of creative industries and other sectors of Danube region economy.

Collaboration network concept is a transnational initiative, based on the trends and events which are mainly visible and experienced on the local level. It is designed to enhance the business

environment through the development of innovative approaches, transfer of best practice methodologies, adjusted to the transnational framework and capabilities of partners in relation to current and forthcoming challenges and potentials. In a nutshell, the Collaboration concept will introduce transnational networking in development of creative industries, primarily based on application of ICT in introducing innovations in local economies, primarily FBI.

Initial period is used for expansion of the initial network with relevant members, primarily stakeholders not involded officially as partners in FORESDA. CN Creative HUBs was heavily leaned on the number of pilot interventions which have been launched within the framework of FORESDA (Development of pilot innovation environments) and innovation projects initiated by partners across the Danube Region as consequence of transnational cooperation and cross sectoral approach.
Opportunity to purse the goals and objectives of CN Creative HUBs, within the 3rd Call for proposals of DTP is used, with work on two project concepts on the level of Collaboration network.
Two project concepts are submitted within the framework of CN Creative HUBs, as official proposals for 3rd Call for Proposals of DTP:

1. Fostering the interface between the traditional wood craft culture and the creative industries for increasing the use of regional natural resources and competitiveness of wood-processing culture through innovation and transnational cooperation - DanubeWood4Creative.

2. Industry 4.0, targeting transnational capacity building development of economic environment in order to spread the Industry4.0 solutions and Development of competences, learning methods and innovative culture in local businesses using Industry 4.0 solutions.

3.2.4 Conclusions and Recommendations

- Process of concentration of organizations interested and working on the concept of Creative HUBs in close correlation with forest-based industries is initiated mainly as a result of promotion and animation efforts of FORESDA partners. The network has reached relevant size, involving 28 members with relevant expertise, originating from business support sector, Knowledge partners (R&D) and SMEs. Transnational approach is applied, which is a good prerequisite for initiatation of cooperation on this level. The structure of the network is in line

with the plan and expectations. Major achievent in respective period is a joint approach to the process of preparing of new projects, proven with 2 proposals already subimitted for the 3rd Call for proposals within Interreg Danube Programme.

- However, expansion of the network has created new challenges. In order to manage and coordinate network activities, it is necessary to establish certain communication structure, which will secure desired level of understanding and involvement of members. Additionally, expertise of each network members have to be revealed, in order to understand full potentials of each individual member and the network in general.

- In order to secure desired level of activities of the Collaboration Network for Creative HUBs, primarily task is to create appropriate communication channels for exchange of information and acquaintance with the scope of work and expertise of all individual members. Social networks will be the initial tool for this purpose. On a long run, individual meetings and visits will be organized on the bases of expressed individual or group interests for initiation of specific collaboration or cooperation projects, or pure identification of potential topics of mutual interest.

- Pilot actions implemented within FORESDA, which had a specific relevance to the topic of collaboration of IT/Creative sector and Forest-based industries serve as proof-of-concept and the baseline for follow-up.

3.3 CN "SOCIALLY RESPONSIBLE USE OF FORESTS"

3.3.1 INTRODUCTION

Forests provide a wide range of economic and social benefits to the society. These include contributions to the economy through the processing and trade of forest/wood products and energy. The responsible use of forests is based on the sustainable use of natural resources and the anticipation of changes in the environment. In spite of numerous research activities related to the multiple use of forests, socially responsible use of forests is a concept often understood as the reconciliation of recreational use, production of wild berries and mushrooms, and wood production. However, research on multiple use should also include research on ecological, financial and social sustainability. Socially responsible use of forests should encompass both benefits, economic and social, representing the ultimate concept to ensure that wood is used to foster a better state of the world's forests and societies.

As already emphasized, new market trends influence the development of new value chains, aiming to reduce the costs of numerous business phases or even to reduce the number of the phases itself. Therefore, one of the goals of the CN "Socially responsible use of forests" (in further text: FORDIS) is to explore the opportunities towards establishment of the cross-sectoral and transnational projects which will involve and support SMEs in the development of new products and services by establishing of the new value chains. The main purpose is to support socially responsible forest management and smarter use of forest resources which are today endangered by the impacts of the climate change but also other human activities like extensive tree cutting etc. In addition, one of the CN's topics is also the access to forests for socially vulnerable groups. Their special needs, especially within the framework of the development of the accessible tourism across the Danbe region may trigger the development of wide range of new products and services and bring numerous economic and social benefits for the whole region.

3.3.2 STRUCTURE

The coordinator/leader of CN FORDIS is Croatian Wood Cluster, the oldest industrial cluster in Croatia, established in 2003, by following bottom-up approach. Since Croatia is very small, CWC acts on the national level. At the moment, the cluster has about 100 members/companies from all the sectors related to the forest-based industries value chain: forestry, sawmill industry, furniture industry, wood in construction, biomass and renewable energy sources, energy efficiency and

energy storage, design and creative industries, transport, certification, forestry tourism, cultural and social aspects of forests.

Current state of the CN members (June 30th 2019) from 15 countries[1]:

Type of organization profile:

3 Clusters

4 Higher Education

6 NGO

2 Public Institution

1 R&D

2 Regional Authority

4 Regional Development Agency

13 SME

Sectoral profile of SMEs:

Forestry, Furniture production, Flooring, IT, Construction, Metal industry, Biomass

Important remark: Members like regional development agencies are expected to support linkages and contacts with all sectors they collaborate with.

Geographical profile of the CN members:

Danube region: Germany, Austria, Slovenia, Croatia, Serbia, BiH, Hungary, Czech Republic, Romania, Bulgaria, Ukraine

Non Danube region: Italy, Spain, Portugal, Turkey

The role of SMEs in the CN FORDIS is defined by the main objective of the CN, which is to develop products and services, e.g. solutions for sustainable use of forest resources according to the ecological, economical and social aspect. Accordingly, their task is to:

1) Provide information on the existing support environments related to R&D and development of biobased products;

[1] FORESDA ends on 30th of June but the Collaborative Networks are expected to provide the basis for the emergence of truly transnational and cross-sectoral new industrial value chains, thus leading to new developments and economic activities on the long-term. Accordinlgy, the cross-sectoral links and the R&D collaborations initiated will only be fully developed and implemented after the limited duration of the project. Many R&D activities initiated will be maintained after the formal end of FORESDA.

2) Give inputs on their needs for development of biobased products in terms of R&D and possible project activities;
3) Evaluate their internal capacities and possible roles in the process of project development and implementation.

3.3.3 New Value Chains

The first phase of the establishement was dedicated to the identification of the topics which are relevant for the future actions and work plan of the CN FORDIS. Upon the identification results, the CN members elaborated the joint innovation agenda (The project deliverable 5.2.3) – a document which provides an overview of the market trends, potential for innovation and innovation objectives.

The CN members managed to idenfity six market trends which could lead towards establishement of the new value chains:

1. Economic slowdown – Seeking for new/innovative products and services which could minimize the impact of the trend
2. New technology – Providing solutions to manage the forest resources more successfully, sustainably and competitive
3. Climate change – Looking for innovative ways how to use forest resources more sustainably but also how to use forest resources in fighting agains the impact of the climate change
4. Wood residues – A great potential, especially in terms of development of biobased products, but also one of the possibilities to support development of the rural areas
5. Illegal logging – Development of new biobased products which will minimize the need for timber
6. Health issues – Cooperation with the health experts in order to identify new ways how to use all benefits that forests provide for the health, especially in terms of development of the accessible tourism.

Example of new entrants (yellow fields) in the traditional forest/timber processing value chain (blue):

Forest management	Forest harvesting	Transportation of timber	Processing	Selling

The special Tourism / Health IT solutions value that CN Plastics provides is its transnational and cross-sectoral character. By involving members from different sectors which consider the forest-based industries interesting also for their further development, the CN becomes an outstanding platform for exchange of information and experience and building of new collaboration channels among actors from different countries and sectors.

3.3.4 Conclusions and Recommendations

Developing a clear innovation strategy is a challenging process for SMEs in the forest-based industries since they have a rather conservative approach when it comes to future business development.

The following section provide conclusions and recommendations which could be used in the future work of the CN or when establishing a new transnational and/or cross-sectoral collaborative network or similar structure:

- Although considered conservative, there is a need and interest within the FBI to modernize business processes in order to maintain sustainable and competitive industry;
- FBI need a strong support from intermediaries and relevant institutions and supporting organizations in terms of development of innovations;
- Clusters have a significant role in the process of transition towards bioeconomy and can facilitate the cross-sectoral collaboration but also support companies in placing the biobased products on the market;
- Setting and innovation climate within the company and to develop the innovation mindset among employees is as important as setting concrete objectives regarding innovation development;
- Open Innovation 2.0 is a paradigm which is most probably most convenient for the FBI given the fact that FBI are mostly focused on the development of products and projects which tend to be economically and societally sustainable;
- It is important to raise awareness among SMEs on the opportunities to run the business sustainable by respecting ecological and social aspect, but also to support some of the socially vulnerable groups in using forests for recreative purposes and to support them by developing wood- and biobased products specially designed for their needs.

4. NEW VALUE CHAIN CASES WITHIN INNOVATION PROJECTS

FORESDA project aims to generate and validate cross-sectoral and transnational innovation activities not only through the collaborative networks, but also through the innovation projects which are defined as international, cross-sectoral consortia of SMEs, large companies and research organizations aiming to develop new products, processes and services. IPs are implemented within the CNs or by external project partners, but with the support of FORESDA PPs in the form of the assistance regarding the project agreement and a fair allocation of the ownership of the results, as well as support with the creation of the project plan and specific support such as providing the access to external expertise, support regarding internationalization, market intelligence, search for complementary competencies etc.

Just as of the CNs, the main goal of the IPs was to explore the potential to create a new value chain by involving the regional stakeholders in order to ensure the transferability and durability of the project outputs. Therefore, the following subchapters provide an overview of the activities and results achieved within the innovation projects implemented by each of the project partner on regional, transnational and cross-sectoral level[2].

4.1 PROJECT COUNTRY: GERMANY (LP, ERDF PP1, PP2)

The following sections describe new value chain cases tackled within the project Baden-Württemberg in Germany.

4.1.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
IWOfurn	Cross-linkage of the furniture industry, digitization of processes in the furniture industry	Furniture industry and IT sector	Germany/Baden-Württemberg
SoftwareCantina	software-based	Furniture industry and	Germany/Baden-

[2] More information about each IP is available in the following project deliverables:

- 5.3.1 / Training materials for the IPs
- 5.3.2 / A monitoring report on the progress of each IP
- 5.3.3 / A project agreement among the IP partners
- 5.3.4 / A project plan of the IP.

	management of individual service requests	IT sector	Württemberg. For now, the project scope of SoftwareCantina in on a national level within Germany. Nevertheless, after a successful roll-out of the software, a European-wide solution is possible and a long-term goal.

4.1.2 Results and Conclusions

The three German project partners Inno AG, WFG and CyberForum are an ideal combination for connecting relevant stakeholders and strengthening the ecosystem in the project region Baden-Württemberg. Within the framework of FORESDA, the aim was to help the region to transform the traditional companies from the wood sector into a sustainable, innovative and competitive sector making use of the whole wood value chain and of regional competences form other complementary sectors. Supporting the two IPs SoftwareCantina and IWOFurn has contributed to this by bringing together the furniture industry and the IT sector in order to foster cross-sectoral collaboration activities and accordingly address the challenge of the rather low innovation capacity of SMEs. An important lesson learned in FORESDA is that cooperating with players from the ICT sector is important, as digitisation can make the FBI more precise and more flexible and efficient.

4.2 Project Country: Slovenia (ERDF PP3, PP4)

The following sections describe new value chain cases tackled within the project country Slovenia. Support for the GUARDIAN project idea was conducted for the Slovenian company MELU, a door manufacturer, but the project idea will be implemented at an international cross-sectorial consortium of companies from Slovenia, Italy and Spain with the support of EU subsidies. The IQ HOME project idea was implemented within the wide cross-sectorial consortium of Slovenian companies with the support of Slovenian public subsidies. Support within project idea Play with Wood was offered to the company Silvaprodukt, Slovenian partner in the cross-sectoral and transnational consortium. The OUTWOOD project idea was integrated Slovenian-Italian cross-sectorial consortium with scientific excellence and successful SMEs. Project idea WOOLF brings together RDIs and SMEs in the field of building with wood, who are also involved in SRiP Smart

buildings and home, including wood chain. The project idea Mountain Wood joins mountain farmers, local SMEs, RDIs and supporting organisations into cross-sectorial consortium aiming to establish short local value-chains and add value to local mountain wood.

4.2.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
GUARDIAN	The project idea is focused on the development of fire resisting doors made from natural, ecological or/and recycled materials, like cork, mineral based materials and others.	Construction, Wood science, Material science Acoustic, Physics.	Slovenia, Italy, Spain
IQ HOME	The goal of the IQ Home project idea is to incorporate emotional design into smart furniture. With the use of modern technologies and laboratory validation to produce elements with emotional impact that can be integrated into design of furniture products.	Furniture, Creative, Medical, IT, Material science, Physics	Slovenia
Play with Wood	To find solutions for playground and larger outdoor recreational equipment in wood and wood-based materials that fulfil the requirements of the future for sustainability, safety, durability and user preferences.	Material science, Construction, Creative, Wood industry, Wood protection, ICT, RDI, Design	Slovenia, France, Germany, Norway, UK
OUTWOOD	Testing different wood species and different novel methods of wood protection for best	Material science, RDI, Local authorities, Wood science, Material science, Water authorities, Cultural and	Slovenia, Italy

	performance of wood in a mountain plateau and sea water.	Landscape Heritage organisations	
WOOLF	The basic goal of the WOOLF project is to develop wooden structural and window systems that will enable the construction of multi-story modular wooden buildings and to integrate newly developed sensor technology into them.	RDI, Construction, Material science, Design, ICT, Wood Industry, Wood Protection	Slovenia
Mountain Wood	The project aims at adding value to the potential of the Slovenian mountain wood throughout the forest-based value chain.	Forestry, RDI, Material Science, Design, Wood industry	Slovenia

4.2.2 Results and Conclusions

The GUARDIAN project idea represents an innovative product that has the potential for rapid growth and should be further evaluated (in technical but also marketing way) to achieve high success rate for European R&D project proposal. Possible transnational and cross-sectoral cooperation could be investigated. FORESDA partners provided support by setting up the consortium and at development of project proposal.

The project idea IQ HOME could have a great impact on the furniture market, because they deal with completely new concept of furniture development. The approach is cross-sectoral and going in disciplines as medicine, physics which were rarely seen before. This open also quite different Unique selling point (USP) which can give also advantage on the market if marketing strategy will be correctly developed and conducted. FORESDA partners supported the preparation of a feasibility study project.

Proposed project idea Play with Wood is highly innovative and has a great market potential as demand for product made of wood is growing. Cross-sectoral added value is

exceptional, as knowledge and expertise from several different sectors is crucial for successful implementation. FORESDA partners provided support in terms of contacts with foreign institutions and companies and experiences regarding proposal preparation as also set up and monitoring field test sites will be beneficial for the company.

Within OUTWOOD project idea techniques and methodologies suitable for the conversion of sustainable softwood species to high durable will be identified and tested. Results will support the development of environmentally friendly novel techniques of wood protection for wood used outdoors in extreme environment. FORESDA partners provided support by setting up the consortium and to host and lead meetings during development of project proposal.

Project idea WOOLF has a great potential in the fast growing sector of building with wood and development of intelligent furniture and houses. FORESDA partners provided new connections between established consortium and potential new partners, who are also involved in Smart cities and communities and Networks for the transition into circular economy. From tis point of view consortium would benefit from exchange of knowledge and experiences.

Within Mountain Wood project idea 17 partners will develop, test and disseminate best practice in sustainable mountain forest management, new processes and new mountain wood products, which all will contribute to higher value of the mountain wood. The results of Mountain Wood project idea will be transferable to other mountain regions to encourage or improve their local value chains. FORESDA partners provided support in terms of exploitation of the potential of Slovenian mountain wood for the combined operation of farms and other economic operators in order to increase its

value in local forest-wood value chains and in preparation of the documentation.

4.3 PROJECT COUNTRY: AUSTRIA (ERDF PP5)

The following sections describe the development of new value chain cases tackled within the project country Austria, Germany and Slovenia. One of the work package of the FORESDA project was the basis framework for the selection and further development of innovative projects with

different SMEs, universities and research institutes (WP 5). Most of these projects deal with the research funding of various innovative project ideas.

4.3.1 Overview

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
flavour of different wood species	research funding, wood and flavour of food	wood and food industry	Salzburg/Austria
woodVR	research funding, wood renderings;	wood and creative industry	Salzburg/Austria
iwood	research funding, weathering stability of wood	wood industry	Austria
Dämmwolle	research funding, insulation materials	wood and building industry	Austria
CirculAlps	research funding, circular economy and bio-economy	wood industry	Alpine region
fire behaviour of innovative wood materials	fire resistance of wood	wood and building industry	Germany and Austria
aHolz	research funding, thermal activation of materials	wood and building industry	Slovenia and Austria

4.3.2 Results and Conclusions

FORESDA wants to build up a cross-sectoral innovation environment (e.g. WP 4) which supports innovative ideas on a cross-sectoral level with forest-based industries. Based on these innovative project ideas various research project proposals were developed with different actors and submitted to different research funding programmes.

Within the knowledge transfer and innovative project development activities in the WP 4 and 5 more as 20 SMEs and 20 research institutes, business support and cluster organisations were involved in the different activities in the frame of FORESDA project. Six various project ideas were submitted to different research funding agencies to support these projects beyond FORESDA. In six innovative project were involved at least one SME and fulfilled the quality requirements of the FORESDA project.

Only one project was without the involvement of a SME. However, the potential of finding new value chain within the forest based industry to support their development and bio-based materials is very high, so that the expected potential for growth and job creation as well as the cross-sectoral approach were fulfilled.

The involved SMEs can use the results of the different studies to take further steps towards implementing this innovative product/process idea in order to achieve a development and innovation advantage.

4.4 PROJECT COUNTRY: HUNGARY (ERDF PP6)

The following sections describe new value chain cases tackled within the project country Hungary. Cooperation between SMEs in FBI is very low in Hungary. During the project period we tried to show them good practices for common work. We made study tours to foreign country (Austria), and to that kind of companies which are successful in vertical or horizontal value chain.

We looked for cross-sectoral project as well, and we also presented these for SMEs. We investigated sector of bio-composites, and sought good operating value chains of this area. Innowood project is one of the most successful EU project in FBI sector in West-Hungary. Results of the project (11 furniture prototypes) are exhibited several international and national fairs, and one of them are in the Solar Dechatlon competition.

PetSmat is about smart design furniture for pets made of wood. Petsmart works together with furniture- and IT sector.

B Light. Fostering value added business cooperations between SMEs operating on different sides of the Hungary-Croatia border.This project helps to generate value chain as enhance competitiveness of small and medium size enterprises, support the cross border business relations and the innovative cooperation between HU-HR SMEs.

Regionet Competitive initiative has set up a model of regional and cross-border cooperation between wood-based industries SMEs in the border region Austria-Hungary. As a result of this networking based structuring of the regions. Simultaneously, the new value chain created networks in the field of wood sector are in the majority of cases only active within their own core regions.

FEEDSCHOOLS have also new value chain, innovation environment which helps to improve the sustainable energy concumption at schools building. The projects generate and validate new value activites in smart and sustainable school construction and materiales (wood) and school building use, innovative solutions, like gray (waste) water system, solar panel system, buling engineer systems and its education for the maintance staff and managers also. . Feedschools project dedicated to create new value chain. FEEDSCHOOLS strategic objective is to facilitate the implementation of the Energy Efficiency Directive creating conditions so that more municipalities, financing institutions and consultants develop projects of deep renovations of schools in the upcoming years.

EN-EFF project wants to build up a new value chain environment (in smart and sustainable construction and building use, innovative bio based solutions, like gray (waste) water system and its education also.) by SMEs which helps to improve the sustainable energy consumption and also the educated workforce in all sectors. The overall objective is to contribute to the the implementation of nZEB principles through activites and knowledge change. Workforce education and training in new energy efficient and renewable technology is vital for further implementation of nearly zero-energy buildings.

4.4.1 Overview

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
Innowood	*New furniture and wood structure ideas and prototypes*	Wood- and electronics	Hungary
PetSmart	*New product: smart design furniture for pets made of wood*	Furniture ans IT sector	Croatia, Hungary
BLight	*Service*	Business management	Croatia, Hungary
Regionet Competitive	*Service*	Networking, Business management	Hungary
FEEDSCHOOLS	*Service, improvement plan*	Management: schools, management, staff of schools, also students	Hungary
EN-EFF	*Service, knowledge transfer*	Contruction, Managements: experts from bulding construction site and owner of buildings	Hungary

4.4.2 Results and Conclusions

In the project Innowood we were able to follow how form a new value chain in FBI in Hungary. Key roleplayer was PANFA, wood cluster. It presented for us, the important role of the Clusters. We studied Austrian methodology of innovation during the mentoring period in the FORESDA project. As we saw there is an agency collecting and managing for these activities. Our conclusion is, that clusters can do similar processes.

Innoowood project was leaded by PANFA wood cluster. It generated workshops, meetings, interviews of different enterprises, researcers, students and other organizations. It collected all kind of information from these events. Smart devices, furnitures is one of the main field which was mentioned. PANFA indicated the direction of prototype development, and started looking for cooperative partners.Basically for this innovation it needed researchers, and SMEs from two industrial segment: wood and electronics.

A smart furniture product family was the first result of this new value case. It was presented on Klagenfurt Bau Messe, and several other fairs in Hungary and abroad. The final success is, that these products are in product range of a Hungarian furniture producer company.
During this development process we saw good practices, key messages for potential cooperative compaies, and steps of building a new value chains.
Through the other projects we have supported the new value chain and collaboration among research institutes, schools and SMEs with the aim of establishment of new sectoral and cross-sectoral cooperation, similar as Innowood project.
The Pilot Innovation Environments have been also established as a collaboration space for SMEs, schools, institues in FBI and it ensures possibilities to open different segments. Through new value chain thee were several knowledge exchanges, where they were able to share best practices between eachother.
We focused on dissemination of available market possibilities as well, and actively participated in new project idea generations. The developed networks are sustainable and it is expected to be maintained after the FORESDA project ends.
The supported SMEs, schools benefited from value chain as increase of their visibility on regional, national and international markets, while advanced technological knowledge was shared to them.

4.5 PROJECT COUNTRY: CROATIA (ERDF PP7)

The following sections describe new value chain cases tackled within the project country Croatia.

4.5.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
CEKOM SPIN	Support to the development and activities of the Centre of Competences CEKOM Spin	The centre will be primarily focused on the projects related to the smart use of the Slavonian oak but this fact does not limit the possibility to create new value chains based on the cross-sectoral and transnational collaboration. Possible new entrants and creators of the new value chains: plastic industry, IT industry, agriculture, fytopharma	The centre will be based in the region of Slavonia but with the strong focus on the transregional collaboration (Hungary, Austria, Bosnia and Herzegovina, Serbia etc.).
SLAHRA	Support to the development of the	The project puts the accent on the	The branding process is initiated and started by

	brand Slavonian Oak	opportunities which will open after development of the brand of the Slavonian oak. By branding of the species, it is to expect that it will become even more attractive for other sectors to establish the collaboration on innovative projects, products and services. Possible new entrants and creators of the new value chains: plastic industry, IT industry, agriculture, fytopharma	the Croatian partners. However, in some further stages, it is to expect the involvement of the international experts which will be also involved as a relevant stakeholders who will ensure the dissemination of the project results, and who will act as multiplicators

4.5.2 Results and Conclusions

Both projects developed in Croatia belong to a pool of the preparatory actions towards developmet of further innovation projects. This initial phase requires also implementation of the activities which will lead to the change of the mindset. Namely, in spite of the national strategy which is set for the period 2014-2020, there are huge gaps in the implementation, and one of the biggest challenge in the R&D sector is the act that regional innovation ecosystems are not functioning properly, mostly because of the lack of knowledge, vision, and motivation of the intermediary organizations.

Although the IP implementation period was not long, there are several lessons learned which could offer guidance for the replicability and transferability of the IP projects on other topics/sectors/regions in terms of the development of new value chains:

- The establishement of the new value chains within the IP projects cannot be forced. They are being established when there is a clear need on the market with the aim to improve/innovate some product or service;
- In order to support the regional stakeholders in the innovation efforts, they should be continuously informed and educated about the best international practices and experiences related to innovation topics;

- The business support organizations and relevant authorities should find a way how to support SMEs and how to continuously encourage cross-sectoral collaboration towards smarter and sustainable use of natural resources and development of products and services in the framework of the circular economy;
- Coaching, workshops and training sessions should be offered to SMEs in order to bridge the gap of lack of the capacities and knowledge to change the mindset of coworkers;
- Effective communication channels should be established in order to support quality communication among all the stakeholders on regional but also transnational and cross-sectoral level.
- A stronger involvement of relevant institutions and authorities is needed in the process of raising awareness on the potential of forest-based industries.

4.6 PROJECT COUNTRY: ROMANIA (ERDF PP8)

The following sections describe new value chain cases tackled within Romania. Within the INNO WOOD project, through elaboration of RDI agenda of the PRO WOOD Cluster, a new service will be available for cluster members, namely initiating and support cross-sectorial business collaboration, advice for funding, internationalization and marketing, etc.

Within UPS4Industry project, the innovative product developed within the project will be the support tool to achieve the passive house concept or near passive house characteristics at wooden houses. According to the elaborated project proposal, a wooden house producer will install this equipment to the newly manufactured wooden houses. This approach means also a creation of a new calue chain along the wooden house manufacturing.

4.6.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
INNNO WOOD	Management capacities, initiating and support cross-sectorial business collaboration, advice for funding, internationalization and marketing	New cross-sectorial services: advices of funding, internationalization, marketing for SMEs	Romania
UPS4Industry	Energy efficiency	Additional product for	Romania

		wooden house manufacturers to achieve passive house characteristics at wooden houses	

4.6.2 Results and Conclusions

The results of FORESDA project are the following: elaboration of innovative product and providing new supporting services. There are two newly elaborated value chains, namely professional support for SMEs in FBI and innovative product for more sustainable energy supply and better energy efficiency at final consumers.

Based on the INNO WOOD project, initiatied by PRO WOOD, the results are better cross-sectorial business collaboration, knowledge transfer from different sectors towards FBI, increasing of internationalization for SMEs and support regarding fundings for SMEs. The main output of the project is to develop the RDI agenda of the PRO WOOD Cluster. The conclusion regarding to INNO WOOD is that, the necessity for development of the RDI capacity in FBI is essential. The Romanian FBI is characterized by low level of innovation, lack of cross-sectorial collaboration, only a few cross-sectorial innovative products. In this perspective the support for cross-sectorial business collaboration, advices in terms of funding, marketing and internationalization are necessary. In order to provide this support service the development of management capacity at PRO WOOD cluster is essential.

The results of “UPS4Industry” IP are followings: the project idea has been elaborated and validated, a working group has been established for elaboration and implementation of the project, funding soruces are also identificated. The cross-sectorial added value is on collaboration of architects, wooden house producers, electronic engineers and R&D entities. As conclusion the proof for innovativeness in this IP is that the product will reduce the energy consumption for final constumers while the permanent power supply will be ensured for computers, servers and other electrical installations requiring a constant power source.

The conclusion regarding to UPS4Industry is that only by cross-sectorial collaboration can be elaborated a innovative product or service. This is a best-practice case which can be disseminated among the SMEs from FBI sector by PRO WOOD cluster.

4.7 PROJECT COUNTRY: BULGARIA (ERDF PP9)

The following sections describe the development of new value chain case tackled within the project country Bulgaria. One of the work package of the FORESDA project was the basis framework for the selection and further development of innovative projects with different SMEs (WP 5). This IP "Createch Hub" deals with the establishment of physical collaboration area, bringing together multiple stakeholders, including public policy and administration, businesses, research and education, intermediary organisations and end users, contributing jointly to the development of new products, processes and services.

The Missia23 hub will provide to its customers creative co-working spaces, as well as conference center, range of meeting rooms, studios for filming and music recording, rooftop bar for events, matchmaking & networking etc. To ensure the implementation of the mentoring and coaching activities and knowledge exchange workshop, the hub will work closely with experts and highly sucessful professionals, which will host different ideation workshops and implement accelerator programmes. Serendipitous collisions and knowledge gained from those events will be a major value add for our members. Last but not least, the plans are to provide individuals, startups and everyone in the community with all the resources needed so they can focus on what they do best and not have to deal with operations and HR aspects of their business.

4.7.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
Createch Hub	The idea of Createch Hub is to bring together the advanced, smart and talented people from the creative industry in an interactive and friendly environment, so they	Creative Industries - FBI	Bulgaria

	can be challenged, motivated, supported, mentored, educated and inspired. The plans are to create an creative enviroment, where highly successful professionals, with great experience in turning ideas to successful businesses to help others realize their dreams and hopes.		

4.7.2 Results and Conclusions

The establishment and development of the IP depends on the strong involvement and contribution of the stakeholders and the partners, as well as the support from the ministries and other governmental institutions. The project has already received the support of the Sofia Municipality and the Sofia Investment Agency. Moreover, BFC is in close cooperation with the Vienna Business Agnecy, regarding transnational collaboration.

BFC is planning to raise awareness of the project, in order to increase the involvement of new stakeholders and partners, by implementing a promotion campaign, organizing open workshops and other events. Our partners are already several organisations and companies, whose activities are closely connected to the objectives of the createch hub and contribute to the promotion of the project.

4.8 Project Country: Serbia (IPA PP1)

The following sections describe new value chain cases tackled within the project country Serbia.

4.8.1 Overview

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
BOR Wood	The use of chemical wood modifications to	R&D institutions, wood industry, chemical	Serbia and Slovenia

	protect wood against wood-borers in the marine environment	industry, FB companies	
Chabros	Improvement of conventional wood drying	Companies in primary wood processing, R&D institutions, clusters	Serbia
LignoLink	Development of a European research and innovation network in the field of Wood-Based Bioeconomy	R&D institutions, clusters, government and ministries, FB companies	Danube region
MS&Wood	Improvement of wood quality in primary wood processing	Companies in primary wood processing, R&D institutions, clusters	Serbia
WoodNet	Wood Research Centers in the Danube Region	R&D institutions, clusters, FB companies	Danube region

4.8.2 Results and Conclusions

BORWood: The main goal of this project is to obtain new knowledge about the influence of wood modification agents on wood-borers and the interaction between wood modification agents, wood and the marine environment. The result of this cooperation can be the basis for further development of innovative techniques in improving the quality of wood for use under specific conditions.

Chabros: The main objective of this project is to analyze and improve the quality of wood drying in primary wood processing. Research will be performed by UBFF and the obtained results will have application in all enterprises dealing with primary wood processing and drying of wood. As a platform to develop innovative ideas definitely offers a great potential for the building of new industrial value chains.

LignoLink: The focus of LignoLink is on the initiation and development of European research and innovation projects in the field of wood-based bioeconomy. Fraunhofer IMW, together with UBFF and other partners within the LignoLink network, will develop innovative ideas for participation in European projects. The network consists of clusters and R&D institutions from several countries in Europe.

MS&Wood: The main objective of this project is to analyze and improve the quality of wood and wood products in primary wood processing. The project is a platform for the development of new technological processes for improving wood quality, and for better cooperation between R&D institution and SMEs.

Wood Net – is a new innovation projects in the field of wood science and technology. The main objectives of this cooperation are: the development of common wood research strategies, a facility catalogue and an interactive webpage of all wood research devices and methods of each partner to optimize and strengthen the common wood research potential and acombination and exchange of the investigation potential to overcome gaps in the research equipment of single partners.

4.9 PROJECT COUNTRY: BOSNIA AND HERZEGOVINA (IPA PP2, PP3)

In Prijedor Region, Agency "PREDA-PD" was engaged on drafting and implementation of two Innovation projects:

1. Development of Cross-Border Cooperation Network of Creative Industries (Creative@CBC), focused on Cross-sectoral cooperation of traditional and creative industries, with the objective to create favourable environment for development of Creative industries and cross sectoral linkages with IT, Cultural and Traditional industries.
2. Strengthening local capacities for CNC technology applied in wood/furniture industry (CNC), focused on support to vocational trainings in CNC technologies, with the objective to create more favourable access to CNC technologies applied in wood processing and furniture industries for individuals, with active participation of local companies.

4.9.1 OVERVIEW

IP Acronym	Topics	New Value Chain (Sectors)	Countries/Regions Involved
Creative@CBC	Cross-sectoral cooperation of Creative industries and Traditional industries	IT/Creative sector – Forest based industries	Bosnia and Herzegovina, Croatia, Montenegro
CNC	Support to vocational trainings in CNC technologies	IT technologies – Forest based industries	Bosnia and Herzegovina (Prijedor Region)

4.9.2 RESULTS AND CONCLUSIONS

Project proposal Creative@CBC is stil in the process of evaluation. However, in the process of validation of the project by the local actors following remarks are noted as inputs for potential implementation of the project:

- Functional link between the traditional and IT/Creative industries has to be facilitated by relevant actors, primarily development agencies,
- Centre of the attention should be on HUB spaces combining co-working and incubation facilities and services to beneficiaries,
- HUB spaces should be equipped with relevant new technology devices and gathering individuals with specific new technology know-how and skills,
- LivingLab Methodology should be considered as the baseline for providing support to actors locally, regionally and transnationally.

Results of the implementation of project CNC have revealed significance and potential of Lifelong Learning training programs in terms of employment and competitiveness of economy. Application of new technologies as a topic, confirmed its attractiveness for local beneficiaries – SMEs and unemployed persons. Interest for attendance is present, which should be used for future initiatives. Important factor of success is active participation of the private sector in the education process, especially provision of practical trainings and lessons within the formal and non-formal education programs. Employment opportunities should highlited as expected final impact of efforts invested in this type of activities.

5. SUSTAINABILITY AND DURABILITY OF NEW VALUE CHAIN CASES

5.1 SUSTAINABILITY AND DURABILITY OF NEW VALUE CHAIN CASES WITHIN COLLABORATIVE NETWORKS

CN	Sustainability and Durability of New Value Chain Cases
"Building with Wood"	Through the transnational bilateral cooperation of partners, a good framework conditions for innovation is set. Innovations and best practice examples increase the positive image of timber constructions and promote the use of bio-based materials for building. The CN was built to support the development of the building with wood in the Danube region. The main objectives are to develop a broad spectrum of product ideas and to select one of them for R&D and market implementation. For this purpose, the network has submitted a submitted an expression of Interest (EoI) “DOUBLED” on the first step of Third call for proposals of the Danube Transnational Programme.
"Creative Hubs"	FORESDA Project partners agreed to provide follow-up activities with the purpose of further development of Collaboration network. In favor of this process is the cooperation experienced in the process of drafting of two project concepts submitted within the 3rd Call for proposals of DTP. It is expected that the collaboration on future calls for proposals for various EU development schemes will be the backbone of the Collaborative network Creative HUBs. However, in order to expand the focus of cooperation, more detailed and closer communication need to be established. Communication channels have to be improved to strengthen connections within the Network. Drafting of the Communication strategy is one possible option for follow up, as planned by the Joint Innovation Agenda of CN.
"Socially Responsible Use of Forests"	The sustainability and durability of the new value chains established within the CN FORDIS depends on the market conditions and trends. However, the CN can support the further development by: • Regular update of the topics on the Joint Innovation Agenda according to the market trends • Informing the CN members on the fuding opportunities and EU project calls • Continuous support of the members in terms of creating of project proposals • Improving the communication channels among members and involvement of the new members • Organization of the trainings and workshops related to the CN topics or CN members’ capacities.

5.2 SUSTAINABILITY AND DURABILITY OF NEW VALUE CHAIN CASES WITHIN INNOVATION PROJECTS

Project Country/Region	Sustainability and Durability of New Value Chain Cases
Germany	CyberForum is a triple helix cluster in the TechnologyRegion Karlsruhe with more than 20 years of experience in connecting relevant stakeholders, resulting in collaborative networks & projects focusing on regional/transnational innovations. CyberForum is a neutral intermediator and as such able to connect relevant stakeholders on all levels (policy, research, industry, citizens). CyberForum provides access to its network which accordingly, as it was the case for the two supported Innovation Projects SoftwareCantina and IWOfurn, leads to the emergence of new cross-sectoral value chains. By being a hightech.business.network CyberForum supports the wood sector and forest based industries into entering into the ICT sector and accordingly constantly fosters the sustainable establishment of new value chains.
Slovenia	All 6 proposed project ideas support use of wood as a sustainable natural material. They address key challenges through the research, development and maintenance of wooden elements for well-being of natural, outdoor environments as well as for the building made completely out of wood or just of several wooden elements. New value chain cases support collaboration between SMEs themselves but also collaboration and knowledge transfer between clusters, SMEs and RDIs. Through signed Innovation Project Agreements partners confirmed the intention to participate in implementation of poroposed projects. ERDF PP3 and ERDF PP4 are engaged to provide support services for innovation and among partner SMEs and support networking and knowledge transfer activities.
Austria	The work programme and the aims of the projects were developed based on the findings of WP 3, 4 and 5 of the FORESDA project. The potential of finding new value chains within the forest based industry and other industry sectors to support their development and bio-based materials are very high, so that the expected potential for growth and job creation as well as the cross-sectoral approach were fulfilled. After finished these proposed research projects the results can be used to support the SMEs in different regions. Different actors can learn from the knowledge exchanges and technology transfer of the project results for the further market implementation. Also, these project could be used to show the best practise examples and promote the successful collaboration between research institutes and SMEs.

Hungary	In the project Innowood we were able to follow how form a new value chain in FBI in Hungary. Key roleplayer was PANFA, wood cluster. It presented for us, the important role of the Clusters. Innoowood project was leaded by PANFA wood cluster. It generated workshops, meetings, interviews of different enterprises, researcers, students and other organizations. It collected all kind of information from these events. Smart devices, furnitures is one of the main field which was mentioned. PANFA indicated the direction of prototype development, and started looking for cooperative partners. During this development process we saw good practices, key messages for potential cooperative compaies, and steps of building a new value chains. Durability of this new value chain depends on the success of common innovation, and results of this innovation (smart furnitures). PANFA cluster partially can ensure sustainability of this value chain, via new projects, and support sales promotion of common product.
Croatia	CWC is the oldest industrial cluster in Croatia, established on the triple helix approach. Almost 20 years of the experience in the work with SMEs and development and implementation of numerous national and international projects offers a great platform to continue with the current IP activities but also to initiate and support the development of new transnational and cross-sectoral projects. As a leader of CN FORDIS CWC will have the opportunity to use its experience in linking of the relevant stakeholders on national, transregional and transnational level in order to develop projects according to the market trends and needs. CWC puts a big accent on the topics related to circular economy and bioeconomy since forest-based industries can significantly contribute to the development and implementation of those concepts. Accordingly, also future efforts and activities in the sector of EU projects will be dedicated to the development and support of the projects which are related to the establishement of the new value chains in terms of bioeconomy and circular economy.
Romania	Regarding to the sustainability of new value chains, PRO WOOD cluster is engaged to provide support services for innovation among the member SMEs. One of the most important visions of the PRO WOOD cluster is to develop an innovation oriented mindset in the regional FBI. The importance of bioeconomy and circular economy has to be understood among the SMEs, which requires the multi-stakeholders involvement. In this perspective, for a better cross-sectorial collaboration the PRO WOOD cluster involves R&D entities to meet SMEs from different sectors (electrical engineering, design, marketing, experts for internationalization and product design) to elaborate more innovative products. After the INNO WOOD project ends, the initiatied support service for SMEs will be

	provided and regular meetings with the relevant stakeholders will be organized. PRO WOOD cluster has also developed a 5 years long action plan, in which the supporting activity for innovation is one of the most important fields to develop. The new value chain is in cross-sectorial collaboration for innovation for a more competitive and sustainable business activity in FBI. The second value chain is focusing on a new technology and technical solution. The PRO WOOD cluster involved electrical engineers. Wooden house designers, architects and R&D entities to develop a new product. The name of this project is UPS4Industry, where the innovative product will help us to achieve near passive house characteristic at wooden houses, to mitigate the power consumption, to elaborate a more environmentally friendly technology for sustainable energy management at final costumers. The new UPS will ensure permanent power supply for final consumers where the continouse power supply is crucial, with more energy efficiency and more sustainabily in housing sector. This approach means also the establishment of a new value chain, the new UPS technology require the involvement of experts from other sectors, which helps the development of FBI.
Bulgaria	The project aim is also to involve and collaborate with R&D organisations and universities, in order to establish a strong fututre collaborative network and to ensure the educational aspects of the events, organized in the hub. In order to provide the members of the hub grant support or market access programmes, Bulgarian Furniture Cluster works in collaboration with several governmental institutions and international organisations. The business case of Missia23 is not directly connected to selling a product to an end client, but to the establishment of an creative enviroment, where highly successful professionals, with great experience will support creative people in turning ideas to successful businesses to help others realize their dreams. In order to address our target members and to raise awareness of the project and its objectives, BFC will implement a marketing and PR promotion campaign through several disseminating channels.
Serbia	According to ideas of the projects MS&Wood, Chabros and BORWood, the new value chain cases will contribute to better use of wood in the primary wood processing and marine conditions. The results in these projects should contribute to involving the companies, that have a problem with wood quality, in the future projects. On the other side, the new value chains in the projects LignoLink and Wood Net will contribute to better cooperation between R&D institutions and between universities at

	international level. The durability of the new value chain in these cases has a high possibility of success. Also, the new value chains for these projects will contribute developing of new ideas for the future projects. On the other side, better cooperation between R&D institutions, clusters and SEMs are expected. The need to have a sound marketing strategy for addressed during the IP timeframe. Participation at workshops and the science and professional conferences are very important for sustainability and durability of new value chains cases.
Bosnia and Herzegovina	Creative@CBC partnership is dedicated to secure sustainability of created infrastructure and networking model. Sustainability will be the subject of several project activities, including drafting of Joint Action Plan document and Recommendations for policy makers for support to Creative industries. Intention of the consortium is to secure sources of public funding, primarily from local and regional level, ensuring development of the concept in project follow-up phases. Nevertheless, on the operative level, each partner will be in position to secure financing of running and maintenance costs of Creative centres, supporting the work of CREATIVE@CBC Network. It is of an essential importance to keep the available equipment constantly in sound technical condition. Creative centres will function as organization units of partner organization, on non-profit bases, focused on facilitation on interactions and enabling development of products and services for commercial and non-commercial purposes. In order to secure durability of the concept promoted by the CNC project, Initiative is launched to incorporate co-financing of vocational education for CNC technologies in regular local finantial budget framework. Initiative is recognized by the local authorities, providing the funding option in budget framework – funding line - Vocational trainings for deficient professions and jobs on the local labour market.

6. Contribution of New Value Chain Cases to the Priorities of Regional Smart Specialization Strategies

Project Country/Region	S3 Priorities	Contribution	Expected Impact
Germany	S3 priorities of Baden-Württemberg: Sustainable mobility concepts; ICT, green IT and intelligent products; Health; Environmental	Digital and sustainable innovation are fostered through the support of the two IPs SoftwareCantina and IwoFurn.	Closer cooperation along the value chains, support of the digitisation of value chains, contribution to the starndardisation of processes. New possibilities for

	technologies, renewable energies and & resource efficiency		innovation to all partners involved through network effects.
Slovenia	The main S4 in Slovenia are: - Smart Cities and Communities - Smart buildings and home with wood chain - Networks for the transition to Circular Economy - Sustainable Food Production - Sustainable Tourism - Factory of the future - Health - Medicine - Mobility - Development of Materials as Final Products	Proposed project ideas connect innovative and successful SMEs, clusters and RDIs from Slovenia. The consortiums demonstrate scientific and technological excellence. Their work programme follows the key factor ofsmart specialisation strategy - raising the value added per employee through an increased share of (I) high-tech intensive products in export, (II) export of knowledge-intensive services in total export, and (III) increased overall entrepreneurial activity. Proposed project ideas encourage research and innovation based development of economy. By initiating cross-sectoral collaboration and involvement of clusters and RDIs they support the development of bioeconomy and circular economy. Established consortiums promote long-term cooperation betveen involved	Expected impacts of proposed project ideas are: - increased competitiveness of project partners in the consortium; - Development of local value chains with high added value; - creation of valuable knowledge, sharing of infrastructure and knowledge; - development and support of bioeconomy and circular economy; - cross-sectoral cooperation of the complete forest-wood value chain; - sustainable development and attainment of environmental and societal objectives; - establishment of long-term collaboration between RDIs, SMEs and supporting organisations.

		stakeholders. Project proposals are prepared to apply for calls within European Structural and Investment Funds	
Austria	The various innovation project ideas support the smart specialisation strategies (S3) in the S3 Priorities of Life Sciences, Smart materials in Life Sciences and Intelligent Construction and Settlement Systems of the region Salzburg/Austria.	All innovative project ideas have a research based approach and contribute to the mentioned S3 Priorities. Cross-sectoral collaboration in the innovative projects may support establishment of circular economy and bio-economy and protect the climate, most notably via the reduction of CO_2 emissions. Also the projects aimed at increasing the value added of wood-based supply chains and address issues such as advanced processing techniques in order to produce higher value-add products.	A research based approach was used for all innovative project ideas. Therefore, new knowledge and technology will be expected after finishing each of the innovation projects. The results can be used to support the forest-based industry sector to implement high added value products in the market. New cross-sectoral collaborations can be established by different involved actors.
Hungary	N/A (Hungary has no S3 framework)	N/A (Hungary has no S3 framework)	N/A (Hungary has no S3 framework)
Croatia	The CWC activities within FORESDA project (CN and IP activities) contributed to the priority area “Food and bioeconomy, and the subfield “Sustainable production of wood”	The activities contributed to the development of the infrastructure needed to boost the innovation on cross-sectoral and trasnational level (Centre of competences and	The projects represent two channels/platforms which can be used to create more innovation projects on cross-sectoral and transnational level. It is therefore expected that in the future period

		branding of the Slavonian Oak).	there will be more innovation projects within forest-based industries and that the two channels will help to bridge the current gap within regional innovation systems
Romania	The priorities in INNO WOOD project are initiating and supporting cross-sectorial business collaboration, identify innovative solution in FBI, elaborate innovative products with cross-sectorial involvement for bioeconomy and implement the principles of circular economy among SMEs, provide advice for funding, internationalization and marketing. On the other hand the digital technologies and solutions can support the sustainability of SMEs, therefore the involvement of ITC sector, implementation of new approaches, such as IoT and digital innovation in FBI is prioritized. Within the UPS4Industry initiative the priority is to realize an energy efficient and more sustainable	The contributions of INNO WOOD project in FBI are followings: - establishment of regular meetings with experts from different industrial sectors and involvement of D&D entities, supporting the innovation among and in SMEs, catalyse the new product and project ideas for a more innovative FBI. Develop new initiatives with bioeconomy and circular economy approaches in SMEs. By initating UPS4Industry, the main contribution is the design and elaboration of a new technical solution for energy security, high energy efficiency for final costumers. The wooden house manufacturers can enlarge their offers to final costumers with a broader perspective with energy supply of houses. This solutions means a better ground	The expected impacts in the previously mentioned projects are followings: - Establishment of cross-sectorial thinking and collaboration in FBI and other industry sectors which are closer relation with FBI, - New project ideas, innovation for new products and services, - Get new knowledge and technology tranfer among the SMEs - Familiarize with CNC machines, robotic technologies, ITC in FBI - Get inspired by latest technical solutions for more innovation in regional FBI - Elaboration of new innovative solutions, products and services is expected based on

	solution for housing in wooden houses and at SMEs with moderate power consumption. In both cases there is considered the establishment of a new value chain with the support from PRO WOOD Cluster.	for internationalization of SMEs, significantly contribute in competitiveness and provide sustainable business activities for SMEs within FBI.	cross-sectorial and/or transnational cooperation - Internationalization of local SMEs, technical achievements and innovative products - Increase the offline and online visibility of SMEs and their products - Increase the long-term business collaboration within FBI and with other sectors - Harmonize the activities of SMEs with the regional smart specialization strartegies - Develop and implement the bioeconomy and circular economy principles in FBI -
Bulgaria	N/A (Bulgaria has no S3 framework)	N/A (Bulgaria has no S3 framework)	N/A (Bulgaria has no S3 framework)
Serbia	The main S3 priorities (in project region Serbia) with economic and science domains are: 1. Information and Communication Technologies (Information and communication technologies and	New value chains in the frame of the projects BORWood, Chabros and MS&Wood will help to establish a better link between research and innovation activities, with one side, and companies with other side. This will also	-The FBI sector will become an interesting field of industry -The new wood technological processes will contribute to a better quantitative and qualitative use of wood - Greater cooperation between FBI sectors in

	industrial production and technology) 2. Creative Industries (Information and communication technologies and education) 3. Food and Beverages (Agriculture, forestry and fishing and digital transformation) 4. Manufacturing of Machinery and Electronic Devices (Manufacturing and transport, telecommunication and other infrastructures). The policy objectives related to S3 priorities are digital transformation and cultural&creative industries.	allow for better coordination between scientific and industrial policy. For the projects LignoLink and WoodNet new value chains will develop the network for the building of new products and services in Danube region.	order to promote wood as a material -Increased cooperation between companies and educational institutions in order to improve the quality of wood products and competitiveness of finally products on EU market
Bosnia and Herzegovina	N/A (Bosnia and Herzegovina has no S3 framework)	N/A (Bosnia and Herzegovina has no S3 framework)	N/A (Bosnia and Herzegovina has no S3 framework)

7. CONTRIBUTION OF NEW VALUE CHAIN CASES TO THE EUROPE'S BIOECONOMY STRATEGY

The new value chains explored within FORESDA project are fostered through transnational and cross-sectoral collaboration, and several channels: innovation projects, collaborative networks and pilot innovation environment. They all contribute to the following objectives of the Europe's bioeconomy strategy:

- Managing natural resources sustainably - To restore and enhance ecosystem functions, and contribute to the mitigation of climate change, to improve the monitoring capacities and development of the natural resources.
- Reducing dependence on non-renewable, unsustainable resources - A stronger bio-based sector can accelerate the substitution of non-renewable resources. Innovative industrial bio-based processes contribute to the greening of industries and development of circular bioeconomies and products.
- Mitigating and adapting to climate change, has established itself as the global challenge of this generation. Therefore, within the long term greenhouse gas emission reductions strategy, a sustainable and circular bioeconomy is a key to achieve a greenhouse gas neutral Europe.
- Strengthening European competitiveness and creating jobs, is a core policy objective of the bioeconomy. Providing frameworks for developing and deploying innovations and fostering the development of markets for bio-based products, the bioeconomy offers important opportunities for new jobs regional economic development and improved territorial cohesion, also in remote or peripheral areas.

The challenges associated with the emergence of novel value chains, such as hesitation to invest in new equipment and know-how, or missing competencies and integration of different sectors, could be overcome with the strong support of the relevant institutions, strategies and business support organizations but also with the support of the platforms like collaborative networks established within FORESDA project which highlights the importance of the continuation of the project activities also beyond the project lifetime.

8. CONCLUSION

The competitiveness of the Danube Region is strongly linked to the industrial transformation of forest-based industries due to the new business forms of 21st century. Those processes affect the transformation of the Danube regions as a whole, which are now focusing on providing better framework conditions to support the industrial transformation on all levels. The needed transition from a fossil- to a biobased economy requires also the establishment of new value chains. However, they can be only successfully established and developed if there is a market need but at the same time a supportive framework. Previously unrelated actors form new relationships, value chains are moving towards new structural changes which are causing turbulences in the global markets, and the need to renew the traditional management culture is a key challenge of the forest-based industries adapting to those new market trends.

Namely, bioeconomy implicates reusing and recycling of the products, with the main aim to extend the life cycle of the products and resources. Thus in recent years, it has become obvious that the chain actors need support in that process because they face multiple challenges associated with the adoption of new technologies, lack of quality and industry standards, and new regulatory frameworks. Clusters can significantly support all those changes: By gathering all relevant stakeholders of the regional innovation system based on the triple- or quadruple helix model collaboration, clusters can facilitate the cross-sectoral collaboration but also support companies in placing the biobased products on the market.

Those challenges are also recognized by FORESDA project. Although there are many similar EU projects by thematic, the main difference is the active approach and integration of SMEs within the project activities which will continue five years beyond the project. This is especially important for the establishment of the new value chains which, in spite of their opportunities like fostering cost reductions, and supporting the competitiveness, need a continuous support to adjust to the local realities and to be able to face the specifics and traditional approach in using forest resources in a sustainable and competitive way by establishing new regional, cross-regional, and transnational cooperation models.

The transferability and replicability of the FORESDA project activities and outputs can, therefore, support the innovation transfer also in some other projects and sectors, and the project results open the way for some useful recommendations, enabling the proposal of an agenda for further research and policy development in areas such as development of synergies between academia and industry, creation of management strategies to support the flexibility of SMEs to capture opportunities associated with by-product valorization, building a systemic approach at a local level to implement bio-based technology clusters etc., and to boost local rural economies through increased investment in skills, knowledge, innovation and new business models which will support the transition towards bioeconomy along the Danube region.